U.S. Environmental Protection Agency

Region 1 – New England
5 Post Office Square – Suite 100
Boston, MA 02109-3912

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
MAY 03 2016

Ralph Kolb
Senior Environmental Engineer
15 South Smith Street
Norwalk, CT 06855

Re: Request for Information Pursuant to Section 308 of the Clean Water Act
EPA Docket No. CWA-308-R01-FY16-59

Dear Mr. Kolb:

On November 12 through 14, 2015, the U.S. Environmental Protection Agency ("EPA") performed an inspection of the City of Norwalk's ("City's") Publically-Owned Treatment Works ("POTW"), with an emphasis on operation and maintenance of its POTW Collection System. A copy of the report from the inspection is included as Attachment A to this Request for Information. Note that the inspection report provides only preliminary notes from field observations and file reviews and does not, in itself, provide determinations of compliance or non-compliance.

Section 308(a) of the Clean Water Act (the "Act"), 33 U.S.C. § 1318(a), authorizes the EPA to require the owner or operator of a point source to provide information needed to determine whether there has been a violation of the Act.

The City is hereby required, pursuant to Section 308(a) of the Act, 33 U.S.C. § 1318(a), to respond to this Request for Information (the "Request"), except where another schedule is indicated, within **30 calendar days of receipt of this letter**. Please read the instructions in Attachment B carefully before preparing your response and answer each question in Attachment C as clearly and completely as possible.

Your response to this Request must also be accompanied by a certificate that is signed and dated by the person who is authorized to respond to the Request. A Statement of Certification, Attachment D, is attached to this letter.

Information submitted pursuant to this Request shall be in writing and **shall be provided in hardcopy and in an electronic format** to EPA at the following addresses:

John Melcher
Mail Code: OES04-1
US EPA, Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912
melcher.john@epa.gov

Information submitted pursuant to this Request shall be in writing and **shall be provided in an electronic format** to the Connecticut Department of Energy and Environmental Protection ("CT DEEP") at the following addresses:

Ann Straut
Planning & Standards Division
Water Protection and Land Reuse Bureau
79 Elm Street
Hartford, CT 06106-5127
ann.straut@ct.gov

Compliance with this Request is mandatory. Failure to respond fully and truthfully, or to adequately justify any failure to respond within the time frame specified above, also constitutes a violation of the Clean Water Act subject to enforcement action, including the assessment of penalties. In addition, providing false, fictitious, or fraudulent statements or representations may subject you to criminal prosecution under 18 U.S.C. § 1001.

If you have questions regarding this Request, please contact John Melcher, Enforcement Officer of my staff at (617) 918-1663 or have your attorney contact Toni Bandrowicz, Senior Enforcement Counsel at (617) 918-1734.

Sincerely,

James Chow, Manager
Technical Enforcement Office
Office of Environmental Stewardship

Electronic cc: John Melcher, US EPA
Toni Bandrowicz, US EPA
Lisa Burns, Operations Manager, City of Norwalk
Ann Straut, CT DEEP

Enclosures:

Attachment A – November 12-14 EPA Inspection Report
Attachment B – Instructions
Attachment C – Request
Attachment D – Statement of Certification
Attachment E – I/I Analysis and Project Certification
Compact disc with electronic versions of contents of this Request

Attachment A

November 12-14 EPA Inspection Report

See attached binder and compact disc.

Attachment B

Instructions

1. Provide a separate narrative response to each and every item and subpart thereof set forth in this Request. Precede each response with the text and the number of the item and the subpart to which the response corresponds.

2. If you cannot respond to any item in full, respond to the extent possible. If your responses are qualified in any manner, explain.

3. Any documents referenced or relied upon by you to respond to the Request must be copied and submitted to EPA with your response. All documents must contain a notation indicating the item and subpart to which they are responding. If the documentation that supports a response to one item duplicates the documentation that supports another item, submit one copy of the documentation and reference the documentation in subsequent responses.

4. If information or documents not known or not available to you as of the date of the submission of the response to this Request should later become known, or available to you, you must supplement your response. Moreover, should you find at any time after the submission of your response that any portion of the submitted information is inaccurate or incomplete, you must notify the EPA of this finding as soon as possible and provide a corrected response.

Attachment C

Request

Publically-Owned Treatment Works ("POTW")

1. Submit copies of all Bypass Report Forms and Bypass Notification Logs submitted to CT DEEP between October 1, 2010, and the date of receipt of this Request.

2. During the EPA inspection on November 12-14, 2015 ("EPA Inspection"), the City provided a list of service calls received at its call center between January 6, 2010, and September 8, 2015 (refer to Attachment A, Appendix 12). At least 14 entries from this list (described as "SEWER-BACKUP," "SSO_BYPASS," "LATERAL BACKUP," or "OMI-MISC") do not appear in the bypass information previously provided by CT DEEP to EPA. For each item in Table 1, below, submit a brief description of the event, state whether the event is a Collection System Bypass (as defined in Section 22a-430-3 of the Regulations of the Connecticut State Agencies ["RSCA"]), and the date (if any) on which the event was reported to CT DEEP.

Table 1 – Potential Unreported Bypasses Identified in the City's Service Call Records

Problem	Address	Date Initiated	Resolution
SEWER-BACKUP	35 Pine Point Rd.	03/29/2015	Bypass
SEWER-BACKUP	35 Pine Point Rd.	03/27/2015	Bypass
SEWER-BACKUP	1 MacIntosh Rd.	03/17/2015	Bypass
SEWER-BACKUP	261 Ely Ave.	03/17/2015	Bypass
SEWER-BACKUP	14 Westport Ave.	03/15/2015	Bypass
SEWER-BACKUP	228 Fillow St.	02/19/2015	Bypass
SEWER-BACKUP	2 Oak St.	07/23/2014	Bypass
SEWER-BACKUP	26 Loundsbury Ave.	05/21/2014	Bypass
SEWER-BACKUP	261 Ely Ave.	12/26/2013	Bypass
SSO_BYPASS	38 Bouton St.	08/12/2013	Bypass
SSO_BYPASS	16 Washington St.	06/04/2012	Bypass
SEWER-BACKUP	345 Main Ave.	02/08/2012	Bypass
LATERAL BACKUP	188 South Main St.	05/25/2011	Bypass
SSO_BYPASS	3 Ryan Ave.	04/19/2011	Bypass

3. Submit a spreadsheet presenting influent and wet-weather flows for each event during which the City has discharged from Outfall 002-1 of its Water Pollution Control

Facility ("WPCF") between January 1, 2013, and the date of receipt of this Request. Include the following information in this spreadsheet:

- Time at which the City began discharging from Outfall 002-1;
- Time at which the City ceased discharging from Outfall 002-1;
- Influent flow at 10-minute intervals; and
- Flow to Outfall 002-1 at 10-minute intervals (concurrent with influent flow).

4. Submit a description of the adjustments made to controls (including the storm weir gate) directing flow to WPCF Outfall 002-1 since the EPA Inspection.

5. Section 4(F) of the City's National Pollutant Discharge Elimination System ("NPDES") permit, as reissued on March 24, 2014 ("POTW Permit"), states the following:

   No discharge shall cause acute or chronic toxicity in the receiving water body beyond any zone of influence specifically allocated to that discharge in this permit.

   Information submitted to CT DEEP in the City's Monthly Operating Reports indicates that residual chlorine in the City's discharges may result in acute toxicity in receiving waters when the City is discharging from WPCF Outfall 002-1.

   Submit an analysis of the extent to which the City's discharges from WPCF Outfall 002-1 comply with Section 4(F) of the City's POTW permit. At a minimum, the City's analysis shall include a calculation of the concentration, allowing for the zone of influence, of Total Residual Chlorine for each event between January 1, 2011, and the date of receipt of this Request during which the City discharged from WPCF Outfall 002-1.

   For this analysis, the City shall use the Aquatic Life Criteria in saltwaters provided in Section 22a-426-9(a)(3) of the Regulations of the Connecticut State Agencies ("RSCA") as a standard for toxicity.

6. Section 9(A)(5)(c) of the POTW Permit states the following:

   Combined discharges from 001-1 and 002-1 shall not cause violations of State Water Quality Standards.

   Information submitted to CT DEEP in the City's Monthly Operating Reports indicates that fecal coliform and enterococci bacteria in the City's discharges may result in exceedances of State Water Quality Standards when the City is discharging from WPCF Outfall 002-1.

   Submit an analysis of the extent to which the City's discharges from WPCF Outfall 002-1 comply with Section 9(A)(5)(c) of the City's POTW permit. At a minimum, the City's analysis shall include a calculation of the concentration, mathematically combining the discharges from WPCF Outfalls 001-1 and 002-1, of fecal coliform

bacteria and *Enterococci* bacteria for each event between January 1, 2011, and the date of receipt of this Request during which the City discharged from WPCF Outfall 002-1.

For this analysis, the City shall use the Indicator Bacteria in saltwaters provided in Section 22a-426-9(a)(2) of the RSCA as a standard.

7. The City's Facilities Plan (dated October 7, 2009, and prepared by CDM, Inc.), states that the existing microscreens no longer provide adequate and reliable treatment of wet weather flow and are in need of repair. The 2009 Facilities Plan further states that two microscreens had been permanently taken out of service. During the EPA Inspection, EPA observed that two microscreens remained out of service and that another microscreen had a large (approximately one-foot diameter) hole in the screens. Arcadis' Performance Evaluation Report for the period of May 1, 2014, through April 30, 2015 ("Arcadis 2015 Report"), states that capital improvements were planned for the Supplemental Treatment Facility for FY2015-16. The Capital Budget Summary provided by the City during the EPA Inspection (included here as Attachment A, Appendix 13) states that, in FY 2014-15 and FY 2016-17, a total of $2,500,000 was allocated to Supplemental Treatment Upgrades.

   Submit a description of the City's plans for capital improvements at the Supplemental Treatment Facility.

8. Section 9(A)(9) of the POTW Permit states the following:

   The permittee shall reduce excessive infiltration/inflow to the sewer system.

   Submit an assessment of the amount of infiltration/inflow ("I/I") present in the City's Collection System using the criteria provided in EPA's guidance document, "I/I Analysis and Project Certification," attached as Attachment E.

9. Submit all available updates of the City's Sanitary Sewer Collection System Master Plan, dated December 2009, prepared by Malcolm Pirnie, Inc.

10. Submit all available Sanitary Sewer Evaluation Studies and I/I Control Plans prepared since December 2009.

11. The Collection System Projects Table provided by the City during the EPA Inspection (included here as Attachment A, Appendix 15) states that, in FY 2016-17, the "Sanitary Sewer Rehabilitation (Various Priority)" and "Marvin Beach PS FM Replacement Project" projects are planned. Submit a description of these projects and an explanation as to why these project do not appear in the Capital Budget Summary.

12. The Capital Budget Summary states that during FY 2015-16 and FY 2016-17, no money is provided for general Collection System Rehabilitation. In FY 2017-18, the entire Collection System Rehabilitation budget of $1 million appears to be consumed by a single project, the East Avenue Interceptor Capacity Restoration Project. Submit

a description of how the City will fund other Collection System capital expenditures deemed necessary as problems are found during on-going inspections.

13. CT DEEP's database of reported bypasses includes five unauthorized discharges in 2014 caused by mechanical or electrical equipment failure at Trolley Way Pump Station. The Arcadis 2015 Report indicates that the Trolley Way Pump Station is in fair to poor condition. The Arcadis 2015 Report indicates that under wet-weather conditions, both pumps are needed to manage the flow to the pump stations, leaving no redundancy in case of a pump failure. Submit a description of the City's plans to prevent future unauthorized discharges caused by failures at the Trolley Way Pump Station.

14. The Arcadis 2015 Report identifies the following pump stations with a Risk Rating of 2, indicating that pump stations are likely to require upgrades and improvements in the near future to ensure reliable operation and/or prevent sewer overflows:
    - Bouton Street;
    - Fox Run;
    - Keeler Brook;
    - Marvin Beach;
    - Trolley Way;
    - Shady Beach (Shorehaven);
    - West Port Avenue; and
    - Woodward Avenue.

    Submit a description of the City's plans to prevent future unauthorized discharges caused by failures at the Bouton Street, Fox Run, Keeler Brook, Marvin Beach, Shady Beach, West Port Avenue, and Woodward Avenue pump stations.

15. Submit a copy of the City's sewer use ordinance adopted pursuant to Section 4(D) of the POTW Permit.

16. Submit a copy of any other ordinances used by the City to enforce the General Permit for the Discharge of Wastewater Associated with Food Service Establishments, issued by CT DEEP.

17. Submit a list of Class III and Class IV food service establishments, as defined by Section 19-13-B42 of the State of Connecticut Public Health Code, discharging to the City's Collection System. Include in this list, at a minimum, the following information:
    - The type of Fats, Oils, and Grease (FOG) control device installed at each establishment;
    - The date of last inspection by the City; and
    - Identification of all establishments at which the City has issued written notification of violations between January 1, 2011, and the date of receipt of this Request.

18. Submit a copy of the most recent version of City's FOG Program Policy.

19. Section D of the attached EPA Inspection Report includes a discussion of the City's practices for horizontal asset record keeping and work order tracking.

    Submit a description of any changes that the City has made or plans to make to its procedures for tracking field crew observations of grease or other anomalies in sewer manholes and pipes into its *Cityworks* software.

20. Section D of the attached EPA Inspection Report includes a discussion of the City's practices for pump station operations and maintenance tracking record keeping.

    Submit a description of any changes that the City has made or plans to make to its procedures for incorporating field crew observations of pump station problems into its *Maintenance Connection* software.

    Submit a description of any changes that the City has made or plans to make to its procedures for tracking the timeliness of work order completion.

21. Section E of the attached EPA Inspection Report includes a discussion of the City's practices for preventative maintenance cleaning and inspections of its Collection System.

    Submit a description of the extent to which the City has completed its investigation of sewers that were not inspected prior to the March 2006 Performance Evaluation.

    Submit a description of the extent to which the City has categorized its sewers according to the "Priority 1," "Priority 2," and "Priority 3" system described in Section 3.1.3 of its Collection System Operation and Maintenance Plan ("O&M Plan"), dated November 2015, and prepared by CH2MHill, Inc.

    Submit a description of the extent to which the City has completed inspections of sewers according to the "Priority 1," "Priority 2," and "Priority 3" system described in Section 3.1.3 of its O&M Plan.

22. Section E of the attached EPA Inspection Report includes a discussion of the City's practices for cleaning problem areas in its Collection System ("hot-spots").

    Submit a description of the City's hot-spot cleaning program to clarify if hot-spots are to be cleaned on a 6-week cycle (as provided for by the hot-spot cleaning list), a 13-week cycle (as stated in the O&M Plan), or some other frequency.

    Submit a description of any changes the City has made or plans to make of cleaning frequency in the Bouton Street and Ely Avenue hot-spot locations to address the grease build-up observed during the EPA Inspection.

23. Section H of the attached EPA Inspection Report includes a discussion of the City's practices for operating and maintaining its siphons.

Submit a list of storm events between January 1, 2013, and the date of receipt of this Request when the City performed inspections at the upstream side of the Ann Street Siphon in response to an observed high water level. Provide documentation of observations made at these inspections.

Submit a list of dates on which preventative maintenance inspections were performed at the Ann Street Siphon and the Merrill's Lane Siphon between January 1, 2013, and the date of receipt of this Request. Provide documentation of observations made at these inspections.

Municipal Separate Storm Sewer System ("MS4")

The City owns and operates a Municipal Separate Storm Sewer System ("MS4"). Stormwater discharges and certain non-stormwater discharges from the City's MS4 are authorized by the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems ("2004 MS4 Permit") issued by CT DEEP. The MS4 Permit was re-issued without changes on January 9, 2009, and on January 12, 2016; the MS4 Permit will expire on June 30, 2017. A modified MS4 Permit was issued on January 20, 2016 ("2016 MS4 Permit"), with an effective date of July 1, 2017.

24. Submit a copy of the City's Storm Water Management Plan prepared pursuant to Section 5(b) of the 2004 MS4 Permit.

25. Submit a copy of the City's ordinance or other regulatory mechanism that the City has adopted to prohibit non-stormwater discharges into the MS4, pursuant to Section 6(a)(3)(A)(i) of the 2004 MS4 Permit.

26. Submit the City's MS4 outfall map(s) that comply(ies) with the requirements of Section 6(a)(3)(B)(i) and (ii) of the 2004 MS4 Permit.

27. Submit the following information on the Illicit Discharge Detection and Elimination ("IDDE") investigations performed between January 1, 2011, and the date of receipt of this Request pursuant to Section 6(a)(3)(B)(iii) of the 2004 MS4 Permit:

    - A detailed explanation of the process and steps involved in the City's IDDE investigations to detect, track, and eliminate illicit discharges throughout the drainage areas discharging to these outfalls, and to confirm that no illicit discharges remain at the completion of the IDDE investigations;

    - Maps that indicate the manholes, pipes, buildings, and other items investigated;

    - Results of all water quality tests performed;[1]

[1] It is not necessary to provide copies of analytic lab reports for each water quality test – summary tables of results are preferred.

- All manholes or other locations in each drainage area where the City found evidence of illicit discharges, and the evidence that supports these determinations;

- All manholes or other locations in each drainage area where the City determined that evidence of illicit discharges was not present, and the evidence that supports these determinations;

- Locations of all confirmed sources of illicit discharges found, the date on which each illicit source was confirmed, and the evidence that supports these determinations;

- Whether the confirmed sources of illicit discharges have been eliminated, and if so, on what date;

- The entity that eliminated the illicit discharge(s) (i.e., the City or a private entity); and

- If the confirmed sources of illicit discharge(s) have not been eliminated, the schedule according to which the illicit discharge(s) will be eliminated.

28. Submit a copy of the ordinance or other regulatory mechanism that the City has adopted to reduce pollutants in stormwater runoff to the MS4 from construction activities that result in a land disturbance of greater than or equal to one acre pursuant to Section 6(a)(4)(A)(i) of the 2004 MS4 Permit.

29. Submit a copy of the ordinance or other regulatory mechanism that the City has adopted to address stormwater runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the MS4 or directly to waters of the State pursuant to Section 6(a)(5)(A) of the 2004 MS4 Permit.

30. Submit documentation of all representative outfall monitoring that was performed by the City between January 1, 2011, and the date of receipt of this Request pursuant to Section 6(h) of the 2004 MS4 Permit.

31. Submit copies of all of the City's MS4 Annual Reports that were prepared pursuant to Section 6(i) of the 2004 MS4 Permit for the years 2011, 2012, 2013, 2014, and 2015.

Attachment D

Statement of Certification

Complete and Include With Your Response

I declare under penalty of perjury that I am authorized to respond on behalf of the City of Norwalk. I certify that the foregoing responses and information submitted were prepared by me, or under my direction or supervision and that I have personal knowledge of all matters set forth in the responses and the accompanying information. I certify that the responses are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

By_____
(Signature)

_____
(Printed)

_____
(Title)

_____
(Date)

Attachment E

I/I Analysis and Project Certification

United States
Environmental Protection
Agency

Office of Municipal
Pollution Control
Washington DC 20460

May 1985

EPA

Infiltration/Inflow

I/I Analysis and Project Certification

Ecology Publication No. 97-03

Introduction

As part of facilities planning for municipal wastewater treatment facilities, the grantee must demonstrate that contributing sewer systems are not, and will not be, subject to excessive infiltration or inflow. This brochure informs grantees and facility planners on how to determine whether excessive I/I exists, and how to certify that excessive I/I has been sufficiently reduced through sewer rehabilitation.

"Infiltration" occurs when groundwater enters a sewer system through broken pipes, defective pipe joints, or illegal connections of foundation drains. "Inflow" is surface runoff that enters a sewer system through manhole covers, exposed broken pipe and defective pipe joints, cross connections between storm sewers and sanitary sewers, and illegal connection of roof leaders, cellar drains, yard drains, or catch basins.

Virtually every sewer system will have some infiltration or inflow. Guidelines have been developed to help determine what amount of infiltration and inflow is considered "excessive." To make this determination, infiltration and inflow must be evaluated separately as discussed below.

Determination of Non-Excessive Infiltration

Based on Needs Survey data from 270 Standard Metropolitan Statistical Area Cities, the national average for dry weather flow is 120 gallons per capita per day (gpcd). This includes domestic wastewater flow, infiltration and nominal industrial and commercial flows. This average dry weather flow should be used as an indicator to determine the limit of non-excessive infiltration. If the average daily flow per capita (excluding major industrial and commercial flows greater than 50,000 gpd each) is less than 120 gpcd (i.e., a 7-14 day average measured during periods of seasonal high groundwater), the amount of infiltration is considered non-excessive.

The 120 gpcd flow rate guideline has been incorporated into EPA's final Construction Grant Regulations. These regulations provide that no further infiltration analysis work is required if the 120 gpcd guideline is not exceeded. If the average daily dry weather flow (DWF) exceeds 120 gpcd, the grantee may request special approval from the EPA Regional Administrator to proceed with project design without further infiltration studies. To receive such approval, the grantee must demonstrate that the increased flows due to infiltration can be cost-effectively treated, and that sufficient funding is available to pay for the local share of project construction and operating costs. In such cases, the incremental cost of treatment capacity over and above 120 gpcd is not eligible for EPA construction grant funding.

The grantee's basic options regarding determination of non-excessive infiltration are listed below:

If Average DWF $\leq$120 gpcd:*

- Grantee may proceed with project design and construction without further infiltration study.
- Grantee may investigate rehabilitation alternatives for specific sections of sewer system where excessive infiltration has been documented.

If Average DWF marginally exceeds 120 gpcd:*

- Grantee may request special approval from EPA Regional Administrator to proceed with the project without further study of infiltration correction alternatives.
- Grantee must demonstrate that project is cost-effective (i.e., that treating increased flows due to infiltration is less costly than sewer rehabilitation).
- Grantee must demonstrate that sufficient funds are available for the local share of project cost, including capital and operating costs.
- The treatment facility must be sized to treat the total flow including infiltration; however, the incremental cost of treatment capacity above 120 gpcd is not eligible for EPA construction grant funding.

If Average DWF >120 gpcd*, and Special RA Approval is *not* granted:

- Further studies must be conducted to quantify excessive infiltration and evaluate alternative corrective measures.
- Based on results of these studies, the most cost-effective sewer rehabilitation program is selected, and the treatment plant is sized to handle the infiltration that cannot be cost-effectively removed.
- Upon approval of the proposed rehabilitation program by EPA, grantee may proceed with project design and construction. Total project cost (including sewer rehabilitation costs) is eligible for construction grant funding.

*Highest average daily flow recorded over a 7-14 period during a period of seasonal high groundwater.

Determination of Non-Excessive Inflow

A statistical analysis of data from Sewer System Evaluation Survey (SSES) studies representing more than 45 different sewer systems (i.e., separate sanitary sewer system) indicated a strong correlation between inflow rate and service area population. Based on these data, the average wet weather flow (WWF) after removal of excessive inflow (i.e., that which can be cost-effectively removed) is 275 gpcd. This flow rate should be used as an indicator of non-excessive inflow.

If the average daily flow during periods of significant rainfall (i.e., any storm event that creates surface ponding and surface runoff; this can be related to a minimum rainfall amount for a particular geographic area) does not exceed 275 gpcd, the amount of inflow is considered non-excessive. This calculation should exclude major commercial and industrial flows (greater than 50,000 gpd each). If wet weather flows do not exceed 275 gpcd, the grantee may proceed with project design and construction without further study of inflow correction alternatives. However, if the treatment plant experiences hydraulic overloads during storm events, further study is required regardless of the wet weather flow (i.e., even in cases where WWF is less than 275 gpcd).

The determination of non-excessive inflow is made as follows:

If WWF $\leq$275 gpcd,* and the treatment plant does not experience hydraulic overloads during storm events:

- Grantee may proceed with project design and construction without further inflow studies.
- Grantee may investigate rehabilitation alternatives for specific sections of the sewer system where excessive inflow has been documented.

If WWF>275 gpcd,* or the treatment plant experiences hydraulic overloads during storm events:

- Further studies must be conducted to quantify excessive inflow and evaluate alternative corrective measures.
- Based on results of these studies, the most cost-effective sewer rehabilitation program is selected, and the treatment plant is sized to handle the inflow that cannot be cost-effectively removed.
- Upon approval of the proposed rehabilitation program by EPA, the grantee may proceed with project design and construction. Total project cost (including sewer rehabilitation cost) is eligible for construction grant funding.

*Highest daily flow recorded during a storm event.

I/I Cost-Effectiveness Analysis

Before obtaining a grant for sewer system rehabilitation, the grantee must determine the amount of infiltration and inflow that can be cost-effectively removed. This is essentially an estimate of the point at which the cost savings (i.e., reduction in transport and treatment cost less the cost of the rehabilitation program) is maximized. Generally, the planned I/I reduction (i.e., the target sought in a sewer rehabilitation project) is determined on the basis of a cost-effectiveness analysis. *Figure 1* illustrates how the planned I/I reduction target is established from cost curves developed in the cost-effectiveness analysis. A separate cost-effectiveness analysis should be done for infiltration alternatives and for inflow alternatives.

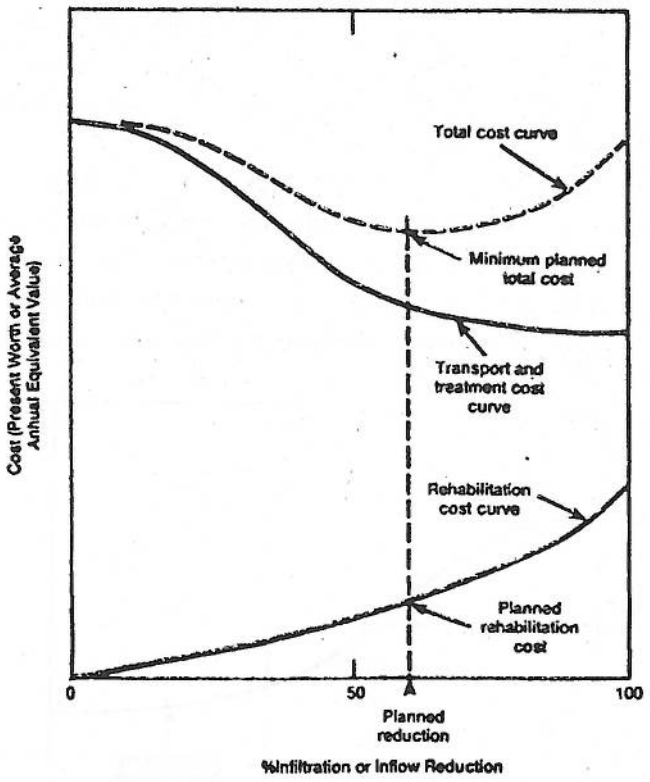

Figure 1 Cost-Effectiveness Analysis

Certification of I/I Rehabilitation Performance

At the end of the one-year performance period (i.e., one year after initiation of sewer system operation), the grantee must certify that the rehabilitation project has achieved an acceptable level of I/I reduction. Ideally, this means that the planned I/I reduction target is achieved at a cost not exceeding that projected in the cost-effectiveness analysis. However, past experience has shown that it is difficult to measure the effectiveness of an I/I rehabilitation program simply by comparing flow data before and after sewer rehabilitation.

A sewer rehabilitation project will be considered certifiable as long as the project is cost-effective (i.e. transport and treatment cost savings exceed rehabilitation costs). *Figure 2* illustrates how to determine the minimum acceptable I/I reduction using the transport and treatment cost curve from the cost-effectiveness analysis. A separate determination should be made for infiltration and for inflow, consistent with the original cost-effectiveness analysis.

The actual cost of the rehabilitation program (i.e., the "sunk cost") should include design costs and the cost of the SSES study, as well as the cost of the sewer rehabilitation itself. The actual I/I reduction is determined by comparing post-construction flow to the flow data collected during the SSES study. The post-construction flow data should be based on plant flow records. Monitoring flows at multiple points throughout the sewer system is not recommended.

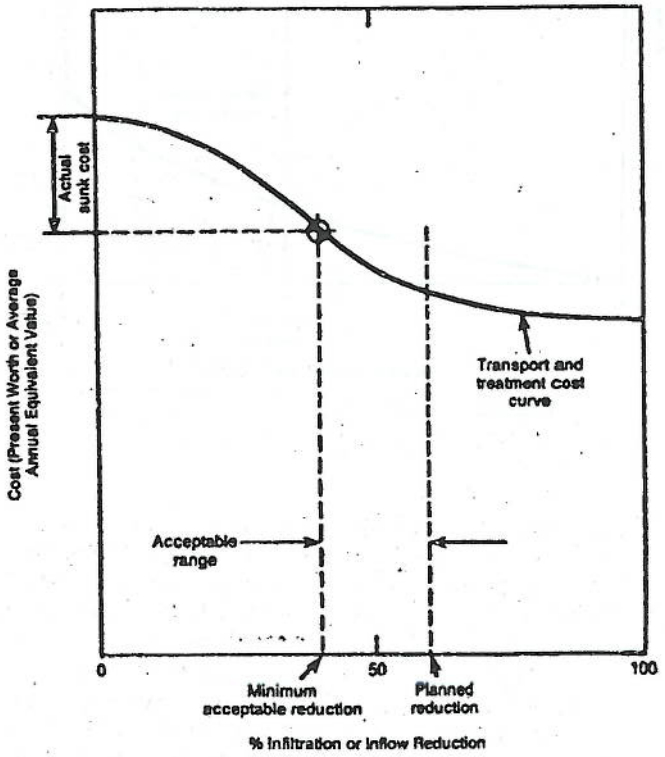

Figure 2 Determining Acceptable Range of I/I Reduction

If the actual I/I reduction is greater than the minimum acceptable I/I reduction derived from *Figure 2*, the rehabilitation project can be certified as meeting performance objectives. However, it should be noted that treatment plant design capacity is based on the planned I/I reduction projected in the SSES study. If the actual I/I reduction is significantly less than planned, redesign may be required to increase treatment capacity. Therefore, every effort should be made to develop realistic estimates of the amount of I/I that can be cost-effectively removed. As an I/I project proceeds from initial planning through design and construction, certain assumptions made during the cost-effectiveness analysis may prove to be invalid. This could affect the cost-effectiveness of the project and the determination of minimum acceptable I/I reduction. For example, if the actual rehabilitation cost is greater than projected, the range of acceptable I/I reduction is reduced (*see Figure 3*). If the reduction in transport and treatment costs is not as great as expected, this will also reduce the acceptable range.

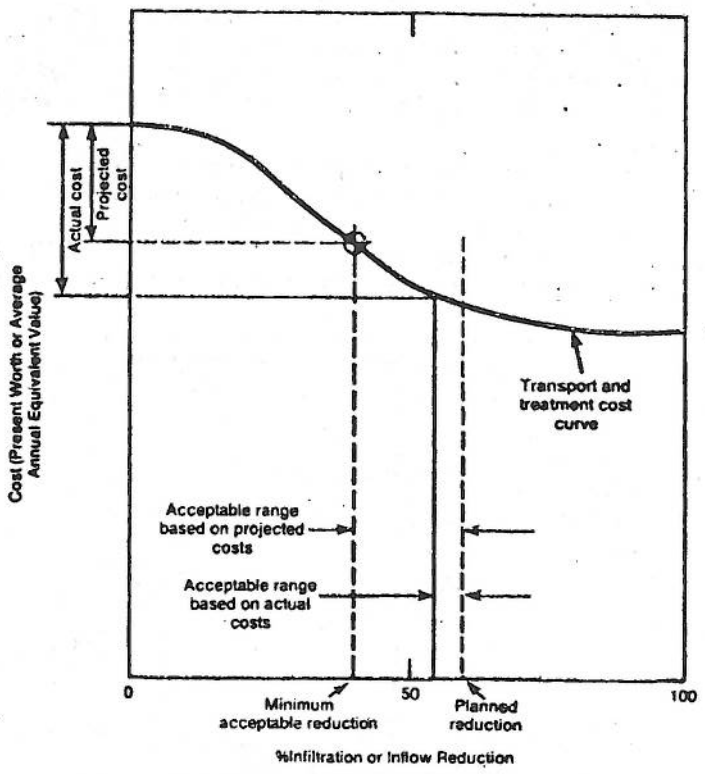

Figure 3 Effect of Underestimating Project Costs

Therefore, it is important to recalculate the acceptable range of I/I reduction at different stages of the project (e.g., after approval of SSES study; after completion of design and preparation of detailed cost estimates; after receipt of construction bids; and at completion of various construction phases) using updated cost estimates or actual cost data.

As the minimum acceptable I/I reduction limit approaches the planned I/I reduction target, the

cost-effectiveness of the project should be reevaluated. The risk of the project not achieving the minimum acceptable I/I reduction increases as the acceptable range derived from *Figure 2* diminishes. If there is evidence that actual rehabilitation costs will be much higher than projected, it may be advisable to reassess the objectives of the rehabilitation program, and modify the scope of work accordingly.

Summary

This brochure presents an overview on how to approach the implementation of an infiltration/ inflow correction program. A schematic of the process is presented in *Figure 4*. The basic steps are as follows:

1. Determine if excessive infiltration exists using 120 gpcd guidelines.
2. Determine if excessive inflow exists using 275 gpcd guideline.
3. If infiltration and inflow are non-excessive, proceed with project design based on measured flow data.
4. If either excessive infiltration or excessive inflow exists, conduct sewer system evaluation survey (SSES) study.
5. Select most cost-effective sewer rehabilitation alternative.
6. Implement sewer system rehabilitation; verify project cost-effectiveness as updated cost data become available.
7. Upon completion of project (i.e., at end of one-year performance period), certify that I/I reduction is within acceptable range.

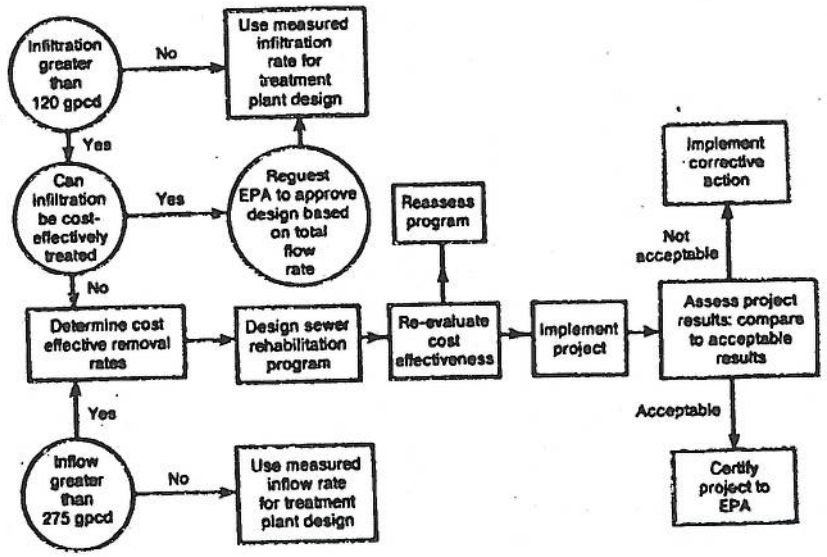

Figure 4 I/I Project Flow Chart

To achieve affirmative project certification, the estimates of rehabilitation cost and I/I reduction must be realistic. Underestimating project cost can invalidate the conclusions of the cost-effectiveness analysis conducted as part of the SSES study. It is important to include all cost items in the cost estimates (the cost of service line rehabilitation should be included even though it is not grant eligible).

Sewer rehabilitation programs can significantly reduce transport and treatment costs, and therefore should be given serious consideration. However, the cost-effectiveness of such projects must be carefully evaluated to assure that rehabilitation is justified. The requirements for project certification now mandate that project cost-effectiveness be confirmed at the completion of the project. Grantees and their engineers should carefully assess their I/I correction plans to be sure that project certification requirements can be satisfied.

Further guidance on this subject is available from U.S. EPA Regional Offices and delegated State agencies.